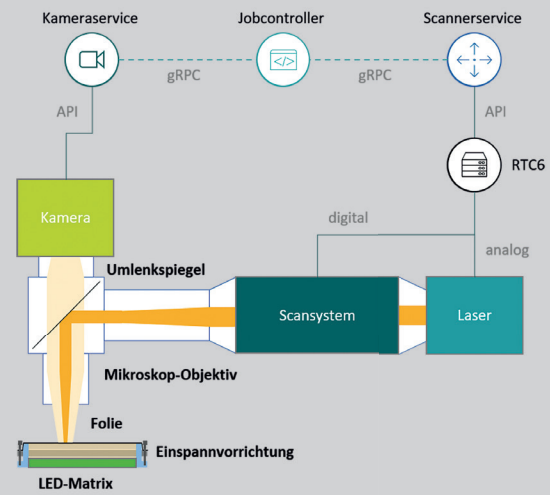


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## DIGITAL MICROSERVICES FOR LAYER-BASED LASER PRODUCTION

### Task

Laser-based production benefits from the initiative arising out of the Fourth Industrial Revolution and the concomitant digitalization of plant technology, the latter of which increases flexibility in production. The individual composition of digital services can positively influence the laser, characterized by its precise and fast positioning, and improve its features for production.

### Method

Digital service processes make it possible to detect imperfections in layer-based laser manufacturing processes such as ultrashort pulse (USP) laser processing and laser powder bed fusion (LPBF) and react to them dynamically in the subsequent layer. These digital services can both monitor quality or be used for process control. Since control processes are dependent upon product, process and sensor, they must be adapted dynamically – to accomplish this, machine learning can be used. Based on real measurement data, an AI algorithm learns a strategy to achieve the desired process goals. The hardware platform chosen allows the process target agents to be replaced easily or updated.

### Results

In collaboration with the Chair for Laser Technology LLT at RWTH Aachen University, Fraunhofer ILT has developed a platform that dynamically loads control algorithms from on-premise data centers or the cloud into the processing system. Analysis, monitoring and control services can be automated and accessed in seconds with this platform, which is scalable to an unlimited number of plants.

This workflow helps users develop further services. Errors in programming are detected at an early stage by virtual machine components, thus reducing development times. The platform enables new business models such as subscription-based leasing of analysis algorithms.

### Applications

The platform can be transferred to other machining processes and, if adapted accordingly, can also provide components and services for other processes.

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- 3 Schematic representation of the services framework for fulfilling various maturity levels of the Fourth Industrial Revolution.
- 2 Communication flow between scanner and camera services in the context of adaptive control for USP.